

Date: Monday, 12/10/2007 12:04:40 PM
 User: Kim Johnston

Process Sheet

4

Customer	: CU-DAR001 Dart Helicopters Services	Drawing Name	: BLADE FITTING
Job Number	: 36235		
Estimate Number	: 12300		
P.O. Number	: N/A	Part Number	: D3488042
This Issue	: 12/10/2007 S.O. No. : N/A	Drawing Number	: D3488 / DSK101
Prsht Rev.	: NC	Project Number	: N/A
First Issue	: N/A Type : MACHINED PARTS	Drawing Revision	: B / D
Previous Run	: 35587	Material	: N/A
Written By	: <u>Jan. 12/10</u>	Due Date	: 12/31/2007
Checked & Approved By	: <u>Jan. 12/10</u>	Qty:	(12) Um: Each
Comment	: Est Rev:A New Issue 06-02-28 JLM : Est Rev:B As per Rev B 06-03-30 JLM		

Additional Product

Job Number:



Seq. #: Machine Or Operation: Description :

1.0 D6103003 alum billet



Comment: Qty.: 1.0000 Each(s)/Unit Total: 12.0000 Each(s)

Alluminum Round Billet D6103-003

Batch: B35953

J.F. 07/12/31

2.0 MORI SEIKI MORI SEIKI CNC LATHE LARGE



Comment: MORI SEIKI CNC LATHE LARGE

1-Turn as per Dwg DSK 101 & Folio FA627

2-Deburr

J.F. 07/12/31

(PTO)

3.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE



Comment: INSPECT PARTS AS THEY COME OFF MACHINE

J.F. 07/12/31

8

4.0 HAAS1 HAAS CNC VERTICAL MACHINING #1



Comment: HAAS CNC VERTICAL MACHINING #1

1-Machine as per Folio FA627 & Dwg D3488

2-Deburr

mf 08/01/11

8

5.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE



Comment: INSPECT PARTS AS THEY COME OFF MACHINE

mf 08/01/11

8

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes ☒ No ☐ DQA: ☒ Date: 08/11/16
 QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
07/12/31	2	Inside ϕ is to big on 8 pieces. I re-machine does ϕ to remove scattering marks.	per ASF 042 08-01-07	Worst case dimension is $\phi 2.240$ NOMINAL $\phi 2.150$ ACCEPTABLE DEVIATION SEE ATTACHED	J.F. 07/12/31	08-01-04	per ASF 042 08-01-04	08-01-04
		chattering						

NOTE: Date & initial all entries

Date: Monday, 12/10/2007 12:04:40 PM
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Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BLADE FITTING

Job Number: 36235

Part Number: D3488042

Job Number:



Seq. #: Machine Or Operation: Description :

6.0 QC8 SECOND CHECK



Comment: SECOND CHECK

FE 05-01-11

(8)

7.0 HAND FINISHING1 HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

M-L

08/01/15

(8X)

8.0 POWDER COATING POWDER COATING



Comment: POWDER COATING

Powder Coat White Gloss (Ref: 4.3.5.1) as per QSI 005 4.3

M 106379

M-L

08/01/16

(8X)

9.0 QC3 INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

FE

08/01/16

(8)

10.0 ALS71032225 INSERT



Comment: Qty.: 4.0000 Each(s)/Unit Total : 48.0000 Each(s)

Pick:

Qty Part Number Description Batch

4 ALS7-1032-225 Insert

M 100489

FE

11.0 HAND FINISHING1 HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Install Inserts as per Dwg D3488

FE 08/01/16

(8)

12.0 QC5 INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

FE 08/01/16 (8)

13.0 PACKAGING 1 PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and Stock

Location:

FP-23

FE

08/01/16

(8)

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Date: Monday, 12/10/2007 12:04:40 PM
User: Kim Johnston

Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BLADE FITTING

Job Number: 36235

Part Number: D3488042

Job Number:



Seq. #:

Machine Or Operation:

Description :

14.0

QC21

FINAL INSPECTION/W/O RELEASE



⑧

Comment: FINAL INSPECTION/W/O RELEASE

2008/01/16

Job Completion



2008.1.16
W

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	36235
Description: Blade Fitting, RH		Part Number:	D3488-2
Inspection Dwg: D3488 Rev: B		Page 1 of 1	

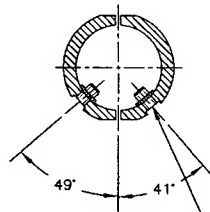
FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
0.125	+/-0.010	.128	✓			
2.620	+/-0.010	2.624	✓			
0.793	+/-0.010	.799	✓			
1.351	+/-0.010	1.348	✓			
1.317	+/-0.010	1.322	✓			
90°	+/-0.1°	90°	✓			
1.802	+/-0.010	1.802	✓			
Ø0.508	+0.006/-0.001	Ø0.509	✓			
R0.062	+/-0.010	R0.062	✓			
1.500	+/-0.010	1.499	✓			
8.000	+0.030/-0.000	8.020"	✓			
11.18	+/-0.030	11.175	✓			
Ø0.484	+0.005/-0.001	Ø0.488	✓			
1.180	+/-0.010	1.180	✓			
3.150	+/-0.010	3.149	✓			
3.070	+/-0.010	3.069	✓			
0.590	+/-0.010	.590	✓			
0.125	+/-0.010	0.125	✓			
1.005	+/-0.010	1.006	✓			
3.500	+/-0.010	3.500	✓			
Ø0.297	+0.005/-0.000	Ø0.299	✓			
Ø0.430	+/-0.010	Ø0.435	✓			
0.100	+/-0.010	.099	✓			

Measured by:	J.F./me	Audited by:	[Signature]	Prototype Approval:	N/A
Date:	08/01/10	Date:	08-01-10	Date:	N/A

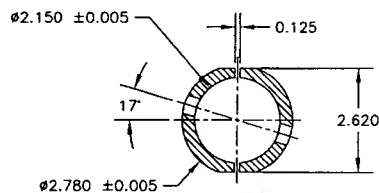
Rev	Date	Change	Revised by	Approved
A	06.03.31	New Issue	KJ/JLM	[Signature]



SECTION B-B

Ø0.297
C'BORE Ø0.430 x 0.100
INSTALL ALS4-1032-225 (OR AKS4-1032-225
OR ALS7-1032-225 OR AKS7-1032-225)
INSERTS AFTER FINISH
(4 PLACES)

4



SECTION A-A

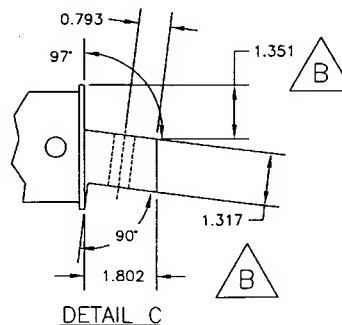
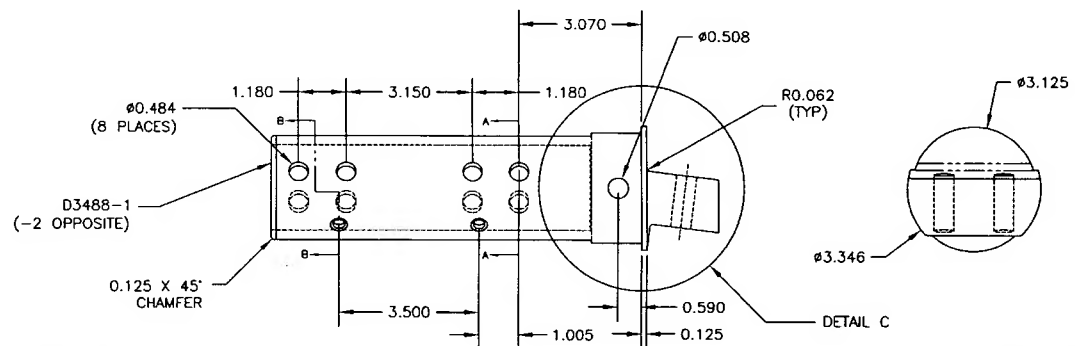
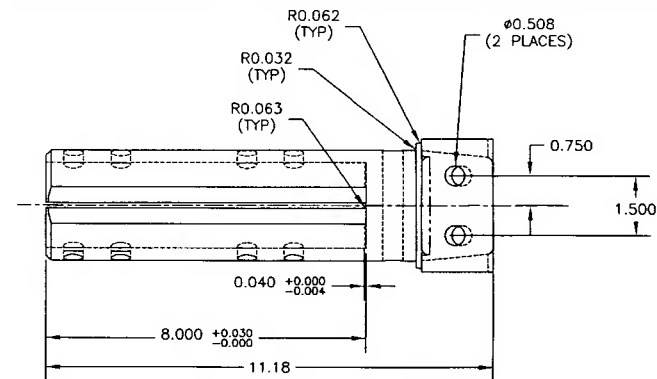
D3488-041/-042 BLADE FITTING ASSEMBLY PARTS LIST

QTY -041	QTY -042	PART NUMBER	DESCRIPTION
X		D3488-041	BLADE FITTING ASSEMBLY (LH)
	X	D3488-042	BLADE FITTING ASSEMBLY (RH)
1		D3488-1	BLADE FITTING (LH)
	1	D3488-2	BLADE FITTING (RH)
4	4	ALS4-1032-225 or AKS4-1032-225 or ALS7-1032-225 or AKS7-1032-225	INSERT

D3488-041/-042 BLADE FITTING

- MATERIAL: MAKE D3488-1/-2 FROM ALUMINUM 7075-T7351 ROUND BAR PER QQ-A-225/9 (REF. DART MATERIAL SPEC M7075T73R)
- FINISH: ACID ETCH, ALODINE PER DART QSI 005 4.1 POWDER COAT WHITE (REF 4.3.5.1) PER DART QSI 005 4.3
- BREAK UNMARKED SHARP EDGES 0.010 TO 0.020
- INSTALL INSERTS AFTER POWDER COAT
- ALL DIMENSIONS ARE IN INCHES
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
36235



DETAIL C

D3488-041 SHOWN (D3488-042 OPPOSITE)

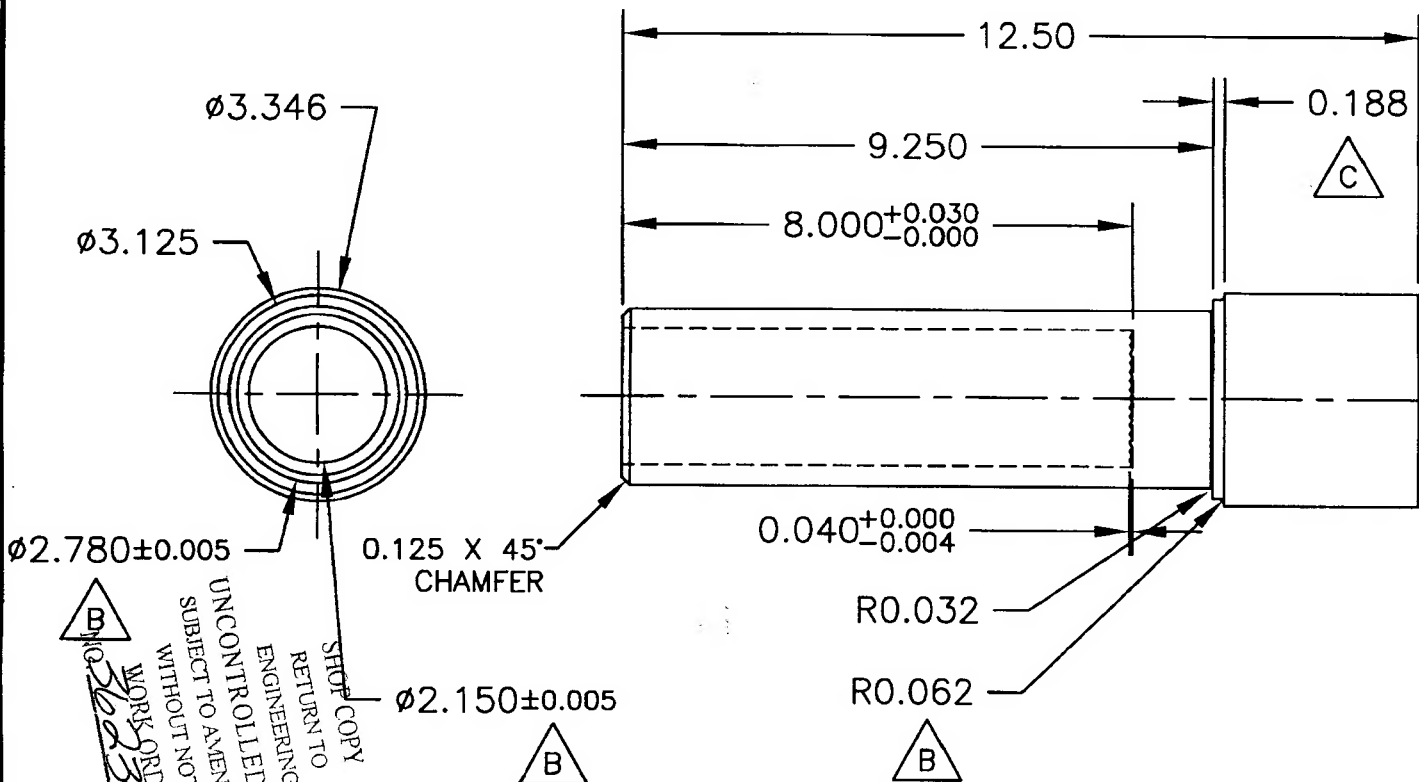
RELEASED
06.03.15 PH
PER DS
EIN #787

B	06.03.15	CHANGE THICKNESS
A	05.12.20	NEW ISSUE
DESIGN	PH	DART DART AEROSPACE USA, INC. PORT HADLOCK, MA
CHECKED	PH	DRAWING NO. D3488
DATE	06.03.15	TITLE BLADE FITTING
		REV. B SHEET 1 OF 1 SCALE 1:3

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DART AEROSPACE USA, INC.

DART

DESIGN	DRAWN BY	DART AEROSPACE USA, INC.		
PH	PH	PORT HADLOCK, WA		
CHECKED	APPROVED	DRAWING NO.	REV. D	
PH	PH	DSK 101	SHEET 1 OF 1	
DATE		TITLE	SCALE	
06.05.09		D3488-1/-2 TURNING DETAIL	1:3	
A	05.12.21	NEW ISSUE		
B	06.03.02	ADD TOLERANCES AND RADIUS		
C	06.04.17	0.188 WAS 0.125		
D	06.05.09	REMOVE DIAMETER FOR CHAMFER		



- 1) MATERIAL: MAKE FROM ALUMINUM 7075-T7351 ROUND BAR PER QQ-A-225/9 (REF. DART MATERIAL SPEC M7075T73R)
- 2) FINISH: NONE
- 3) BREAK UNMARKED SHARP EDGES 0.010 TO 0.020
- 4) ALL DIMENSIONS ARE IN INCHES
- 5) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED

Deviations to DSK 101

Nominal dimension: $\varnothing 2.150 \pm 0.005$

Deviation dimensions:

Dimension	Qty
$\varnothing 2.176$	1
$\varnothing 2.180$	3
$\varnothing 2.194$	1
$\varnothing 2.240$	1
$\varnothing 2.175$	1
$\varnothing 2.170$	2
$\varnothing 2.209$	1

Dimension $\varnothing 2.240$ is the worst case.

Using $\varnothing 2.240$ into analysis from SR-D350-636-2 Rev. B Page 6 and 7 (dated 06.02.23).

$$\begin{aligned} C &= 1.310 \text{ in} && \text{(unchanged)} \\ I &= 1.446 \text{ in}^4 \\ A &= 1.982 \text{ in}^2 \\ I/C &= 1.104 \text{ in}^3 \\ D &= 10.69 \text{ in} && \text{(unchanged)} \end{aligned}$$

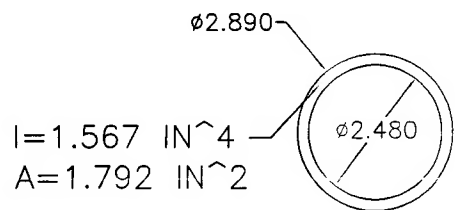
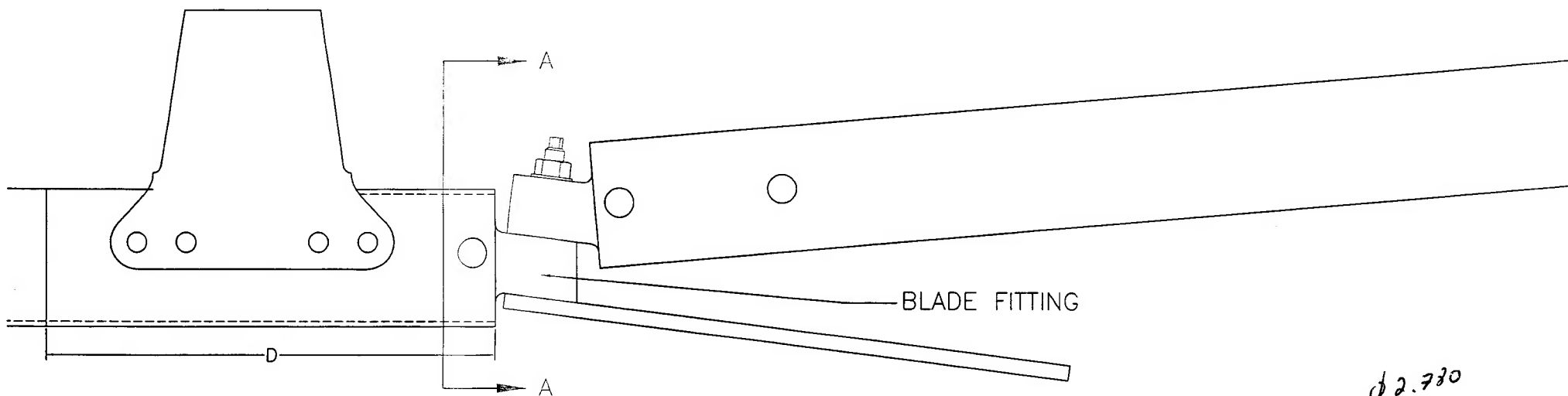
The A, I/C, and D for the Dart blade fitting is still greater than the A, I/C, and D of the Apical blade fitting.

Therefore, the dimension $\varnothing 2.240$ is acceptable.

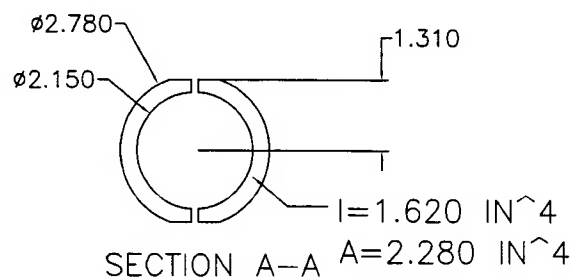


$$\begin{aligned} \text{WALL} &= \frac{2.340 - 2.270}{2} \\ &= 0.035 \\ \text{BORE} &= 2.270 - 0.000 \\ &= 2.270 \end{aligned}$$

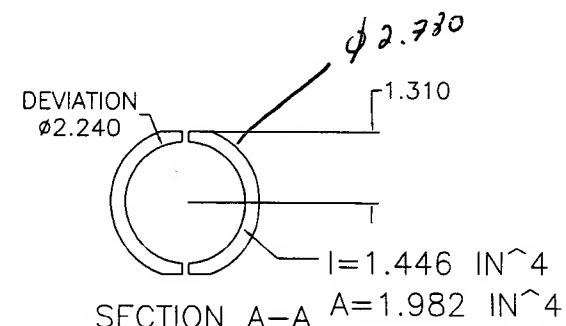
ALSY-1032-225 INSERT WILL STILL BE APPLICABLE



SECTION A-A
APICAL P/N
20473-7/-8
BLADE FITTING



SECTION A-A
DART P/N
D3488-041/-042
BLADE FITTING



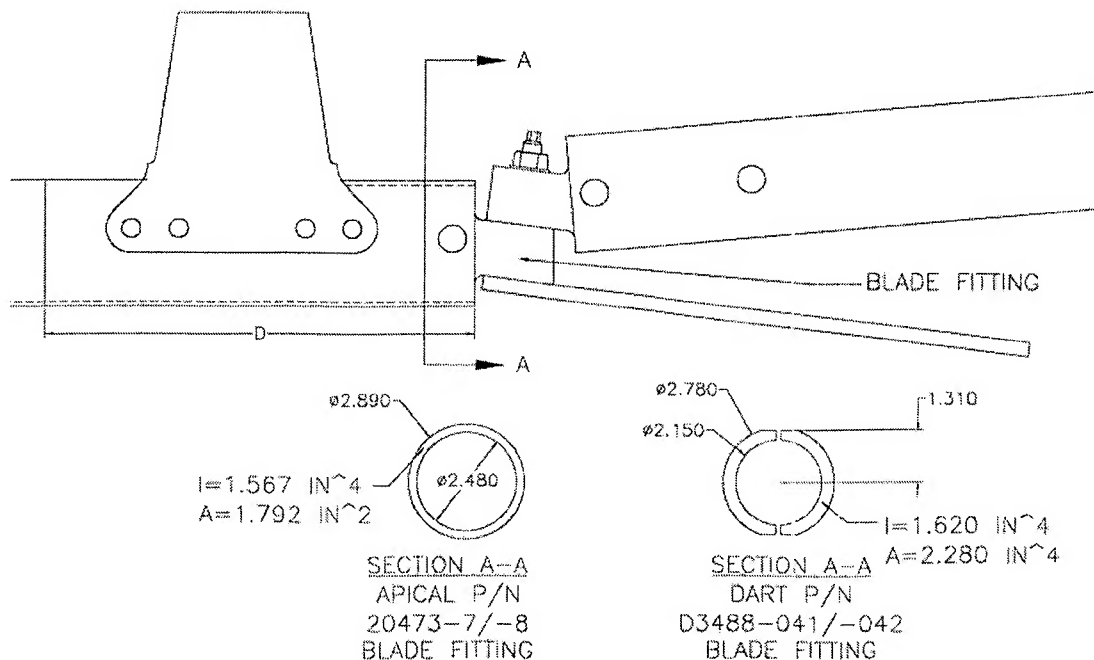
SECTION A-A
DART P/N
D3488-041/-042
BLADE FITTING

For installation of the Apical Tri-bag and Apical Cylindrical Float bag systems onto OEM skidtube; it is required that the OEM P/N 350A41-1077-24/-25 blade fitting be substituted with the Apical P/N 20473-7/-8 blade fitting. In the proposed Dart skidtube configuration, the Dart D3488-041/-042 blade fitting will replace the Apical P/N 20473-7/-8 blade fitting.

In the Dart system, blade fitting D3488-041/-042 will be used to transfer load into the web of the skidtube assembly. On the outside of the skidtube, D3488-041/-042 is dimensionally identical to the Apical P/N 20473-7/-8 blade fitting and is manufactured from the same 7075-T7351 material. Therefore, the Dart blade fitting and the Apical blade fitting have identical structural capability. The longitudinal location of the holes on the D3488-041/-042 blade fitting used to mount the aft crosstube are identical to the Apical P/N 20473-7/-8 blade fitting. The only difference is that the D3488-041/-042 has been designed to withstand higher bending moments than the Apical fitting.

The following table compares the Dart D3488-041/-042 blade fitting to the Apical 20473-7/-8 blade fitting.

Component	Dart D3488-041/-042	Apical P/N 20473-7/-8
Material	7075-T7351 per QQ-A-225/9	7075-T7351 per QQ-A-225/9
(I) Moment of Inertia of portion inside skidtube	1.620 in ⁴ (from D3488-041/-042 dwg)	1.567 in ⁴ (from D20473-7/-8 dwg)
(C) Distance to outer fibers	1.310 in (from D3488-041/-042 dwg)	1.445 in (from 20473-7/-8 dwg)
(A) Area at section A-A	2.280 in ²	1.792 in ²
Z=I/C at section A-A	1.234 in ³	1.084 in ³
D	10.69 in	10.53 in



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Revision: **B**

Date: 06.02.23

Because the material used to manufacture both blade fittings is identical, the fact that the I/C, A, and D for the Dart blade fitting is greater than the I/C, A, and D for the Apical blade fitting demonstrates that the Dart blade fitting can withstand higher bending moments and shear loads than the Apical blade fitting and less localized load is transferred into the surrounding skidtube at the fwd end of the blade fitting.

Finally, the Dart skidtube installation does not change any of the Apical hardware required to install the floats onto the skidtube or attach the aft extension onto the blade fitting. Therefore, this hardware is acceptable by identity.

4.0 Conclusion

Based on the quantitative analysis presented in this report, it was determined that the Dart 636-011/-012/-013/-014 skidtubes will be as good or better than the OEM 350A11-1010-1061/-10315-1070/-1101/-1103/-1171 skidtubes in terms of withstanding the loads applied to the skidtube by the bag float system. Additionally, this report demonstrated that the Dart 636-011/-012/-013/-014 skidtubes are being loaded with an additional 10% safety factor.